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ABSTRACT

A study determined whether instruction on story elements within rich contexts can increase students' understanding of the characters' traits and motives, their comprehension of stories, and their ability to write causally coherent stories. Instruction was organized around an "anchor" (a story rich with embedded information presented on videodisk). For each of 2 school years, two different classes of fifth grade students were selected. One class was designated as at risk for academic failure, and the other class had a high proportion of average achievers from middle-class families. Students in each of the classes were randomly assigned to either an experimental or a control group. During the first year of the project, instruction occurred during three 1-hour periods each week for 6 weeks. In the second year, students received instruction for two 2-hour periods per week for 7 months, reading texts which targeted different story elements. The films "Young Sherlock Holmes" and "Oliver Twist" were used as "anchors." Pre- and posttests consisting of an analysis of story elements were administered. Results indicated: (1) subjects in the experimental groups were provided with a broader and more detailed understanding of the properties of a good story; (2) the study of story elements in the macrocontext of the films on videodisk enhanced students' integrated knowledge structures, as evidenced by the students' ability to comprehend and generate causally coherent structures within stories; and (3) macrocontext instruction was especially effective for at-risk students. (Five tables and one figure of data are included; 19 references are attached.) (RS)

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# EFFECTS OF VIDEODISC MACROCONTEXTS ON COMPREHENSION AND COMPOSITION OF CAUSALLY COHERENT STORIES

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The studies described in this paper investigated how video-based instruction, used to create rich contexts for learning, can help to teach literacy content in ways that encourage students' critical thinking about story content. These studies are part of a larger research project, partially funded by the Office of Educational Research and Improvement, that was conducted to examine the effect of video-based instruction on students' learning and independent use of information. Referring to our instructional contexts as macrocontexts, we developed a curriculum to provide students with multiple opportunities to identify and define problems, to learn what kinds of information are needed to solve these problems, and to construct and use problem-solving strategies.

Central to our instructional approach is the provision of an anchor (e.g., a story, rich with embedded information and presented on videodisc) that permits sustained thinking about a problem and shared learning contexts for developing concepts. One major goal for anchored instruction is to allow students to experience change in their perceptions of the anchor as they develop an understanding of how the anchor can be explored from multiple points of view. The provision of information in the form of macrocontexts--contexts that are semantically rich and that can be used to integrate concepts across the curriculum has been shown to help students acquire new information and aid students' organization of previously acquired information (Bransford, Sherwood, Vye, & Rieser, 1986). Researchers attempting to identify the cognitive processes that influence reading comprehension suggest that

thematically-based instruction that is contextually rich and intensive promotes effective comprehension (Graves, Cook & LaBerge, 1985; Risko & Alvarez, 1986).

Our experimental instruction is organized around the movie (on videodisc) Young Sherlock Holmes. This film provides an excellent model of problem solving (through the study of Sherlock) and invites students to generate questions for finding and learning information about story development. The study of this film has provided multiple opportunities to learn story elements, such as setting (London during the Victorian era), character development, including character conflict and motives influencing actions, and events causing goal formation and goal resolution. A second video anchor, Oliver Twist, was introduced our second year to provide our students with a more balanced presentation of the setting of the Victorian era (by inviting students to contrast social conditions of the Victorian era as depicted in each film), and another rich example of causally-linked events within a well-developed story.

Our plan to enhance students' knowledge about stories includes attempts to expand their conceptual knowledge of story content, their structural and genre knowledge of story organization, and their knowledge of goals and intentions that guide authors' composition. In particular, our instruction focuses on enabling students' comprehension of causal relations that occur within and across story episodes. We want our students to understand and generate causes for story events, such as how particular motives contribute to designated actions or how one event can cause a related outcome. Cause-oriented frameworks within stories provide

text coherence (Black & Bower, 1980; Yussen, 1982), and consist of a network of motives, obstacles, events, and/or actions and their related consequences (Graesser & Clark, 1985).

Early in our project, we learned that our fifth-grade students had difficulty tracing causal connections within the major plot and subplots of our mystery, Young Sherlock Holmes. Further, when asked to write narratives, our students generated stories containing action sequences, but little information was provided about characters' goals, reasons associated with characters' actions, or events leading to goal resolution. Our observations are consistent with research findings of investigators who have examined factors contributing to story comprehension and students' narrative writing. For example, McConaughy, Fitzhenry-Coor, and Howell (1983) indicated that story summaries produced by middle school students were organized around action statements, but contained insufficient information about goals, character motives, or causal relations across plot elements. Similarly, Shannon, Kameenui, & Baumann (1988) found that second-, fourth-, and sixth-grade students had difficulty generating causal inferences that describe motives for characters' actions. Bamberg (1984), who conducted a reanalysis of NAEP essays, indicated that these compositions often lacked coherence because story elements, such as character motives (microstructures) were not linked causally within a network that establishes a global meaning or overall story plan (macrostructure).

As Stein (1986) and others suggest, narratives contain complex networks of concepts and require several types of knowledge if

reading comprehension and writing activities are going to be successful. To comprehend and compose narratives, readers and writers must establish topic ideas that can hold a story together and acquire knowledge about the goals and intentions that guide an author's development of these ideas (Stein, 1986; Shannon, Kameenui, & Baumann, 1988). Knowing characteristics of genre conventions, such as causal relations found among elements in a mystery can guide a reader's perceptions and expectations of story information (Rumelhart, 1975, 1977; Stein & Glenn, 1978; Thorndyke, 1977), and aid comprehension (Black & Bern, 1981; Graesser, Robertson, Lovelace, & Swinehart, 1980; Nezworski, Stein, & Trabasso, 1982; Spiegel & Fitzgerald, 1990). However, as suggested by Mandler (1984), readers and writers may be unable to generalize story events and actions without repeated experiences with the particular story event that is under investigation. Multiple experiences with different story properties, such as events that start (cause) the action of the story, are needed to help the reader and writer plan for those events in subsequent narratives that they read or compose.

In this paper we discuss research conducted during the first two years of our 2.5 year "Young Sherlock" project. The goal of the experiments described in this paper was to determine whether instruction on story elements within rich contexts can increase students' understanding of characters' traits and motives, their comprehension of stories, and their ability to write causally-coherent stories. Rather than presenting story information (e.g., feelings and motives of characters, events contributing to plot

development) in discrete contexts, we organized our instruction around our anchor. Young Sherlock provided us with rich examples for our students to learn about multiple dimensions of stories. Using the anchor, we traced complex relations among story elements by focusing students' attention on characteristics of good detectives, like Sherlock and Watson. We traced motives for actions and reasons for conflicts between the protagonists and antagonists. We examined how conflicts can lead to goal formation and how attempts to resolve goals can produce solutions for problems.

In contrast, our instruction for our comparison groups followed a traditional instructional plan. For example, story grammar elements are typically taught within basal reading programs, but such instruction usually targets each element separately and within different stories. Adhering to this plan, our control students read several narratives and examined a specified story characteristic within each story and corresponding activities. The same content was taught to the control groups, but instruction for these groups was not related to an anchor.

## METHODOLOGY

### Subjects

For each school year, two different classes of 5th grade students were selected. Class 1 (mean Stanford Achievement Test comprehension percentile scores for year one and two were 51 and 53, respectively) was designated as at risk for academic failure because it had a high proportion of low achievers, who were

children of single parent homes and low-SES families. Students in class 2 (mean Stanford Achievement Test comprehension percentile scores were 64 and 62, respectively) had a high proportion of average achievers, who were children from middle class, educated families.

Students in each of the classes were assigned to either an experimental or control group (creating 2 experimental and two control groups) using stratified random assignment procedures according to percentile scores on the achievement test. Our graduate student research assistants served as teachers for the experimental and control groups. During the first year of our project, instruction occurred during three one-hour periods each week. In the second year, students received instruction for two, two-hour periods a week.

Instructional Materials

Year One. Students in the experimental and control groups read The Case of the Parking Meters, an Encyclopedia Brown mystery. Additionally, the control groups read an adventure story, Strangers Until Today; an informational story about deciphering codes, How to Keep a Secret; and a folk tale, Alexandra the Rock Eater. Each narrative was used to target different story elements. In addition to the Encyclopedia Brown mystery, experimental students read a book that corresponds to the film and a science fiction narrative, People of the Third Planet. Students in all groups viewed the Sherlock Holmes film. Scenes were accessed appropriately to highlight target concepts for the experimental students.

Year Two. Students in the experimental groups read The Adventure of the Gree Interpreter and Alexandra the Rock Eater. Students in the control groups read Strangers until Today, The Tree People, Alexandra the Rock Eater, Will to Live, and Sarah Plain and Tall. Students in all groups received the Young Sherlock Holmes and Oliver Twist films. Scenes were accessed appropriately to highlight target concepts for the experimental students. Worksheets, corresponding to basal activities, were provided for control students.

Assessment Materials

Year One. A pre- and posttest consisted of an analysis of story elements generated within students' composition of a mystery. Posttests required students to (1) identify story grammar elements within a narrative, (2) read a narrative and write a retelling of most important story ideas, (3) read a narrative and answer a set of questions requiring comprehension of causal relationships within and across episodes.

Year Two. Pre- and posttests consisted of narratives or video scenes and sets of written questions requiring (1) analysis of character traits, feelings and motives; (2) identification of story grammar elements; and (3) comprehension of causal events within story plots. Additionally, students were asked to write a mystery to determine spontaneous use of story elements and to evaluate organization according to a causally-orientel framework.

Story grammar units within retellings and compositions were scored according to Morrow's (1986) scoring system. Causal-

coherent organization of compositions was evaluated following Graesser and Clark's (1985) representation of cause-oriented substructures of narratives.

Design

A four group, repeated measures design was used. Data were analyzed for each measure using either a post-test only analysis of variance or a 2 X 2 repeated measures analysis of variance with group (experimental vs. control) and test (pre and post) as variables. Post hoc comparisons were analyzed using the Tukey-B procedure. For pretest and posttest conditions, a one-way analysis of variance was conducted to determine differences on either the pre- or posttest scores.

## Year One, November-January

Objectives

Goals for experiments conducted during year one were to determine the effects of our macrocontext on (1) students' ability to identify story elements, (2) students' ability to use story elements to guide a written story retelling, (3) students' comprehension of causal information relevant to plot development, and (4) students' use of story structural elements in student-generated stories.

Procedure

Lessons for both experimental and control groups focused on story elements, character traits, and the vocabulary and/or context

an author may use to present this information.

Experimental groups. The unit, organized around the theme of detectives solving problems, contained video scenes and narratives for the source of content. All lessons were tied directly to the anchor to provide a macrocontext in which video segments were provided to elaborate on and make associations among targeted concepts. Story structure elements were studied simultaneously and used as "tools" to analyze the film and narratives. The unit began with a discussion of characteristics of detectives and an inspection of scenes that were selected from Young Sherlock Holmes to illustrate the identified character traits. Video scenes were examined to establish the concepts of "antagonist" and "protagonist". Students were given the opportunity to explain the language an author may use when writing a accurate portrayal of the characters viewed in the video. Students examined the plot and subplots by discussing the setting, characters, goals, and events contributing to the goal resolution. Setting, characters, and plot development was discussed after the students read the Encyclopedia mystery. Students compared the Sherlock Holmes and Encyclopedia Brown mysteries by identifying similarities and differences across story elements. Students wrote their own mystery, incorporating story elements that had been discussed. They read the science fiction narrative and completed story frames requiring identification of the setting, initiating event, important events and outcomes, and the resolution of the main problem.

Control groups. Across a series of lessons and narratives, students were asked to define vocabulary that were generally

related to story content and specifically related to story structural elements, including character traits. Students were introduced to the same concepts as the experimental groups and were given an equivalent number of opportunities to study each concept, but these concepts were developed within unrelated stories and lesson activities. Adhering to traditional basal instruction, story elements were identified and taught separately in unrelated contexts.

Activities varied for these students. For example, students read the folk tale, differentiated the protagonist and antagonist, and described character traits, emotions, and feelings. Students completed worksheets requiring a match between characters and character traits. Students read the informational text and dramatized character traits (e.g., scrutinize was a character trait that described how the coded messages were interpreted). After reading Encyclopedia Brown, the students were asked first to describe the characteristics of a mystery and then to write a paragraph, following an outline, describing the setting of the mystery. After reading the adventure story, students categorized the events (i.e., initiating events, action/outcome events, and resolution), and organized these events in sequence to create a cartoon. For each basal story, students completed skillpak activities accompanying the basal reader and that were unrelated to story elements.

Results

Three posttest measures required students to read a narrative and identify story grammar elements, to write a story retelling

containing most important story ideas, and to read a narrative and answer a set of questions assessing comprehension of causal relationships within and across episodes. Mean scores for each groups' performance on each measure are reported on Table 1. Data analysis revealed no significant differences between each experimental group and its control group on these measures.

Our fourth assessment required the students to write a mystery. The statistical analysis of pre- and posttest performance on student written stories revealed that the experimental group (combined score) was significantly different from the control group (combined score) on the posttest in generation of resolution information, plot coherence, and on overall (total score) performance. No other significant differences were found. Means and standard deviations are reported on Table 2.

Year Two, September-March

During our second year, several changes enhanced our experimental curriculum. Because we devoted more time (seven months instead of six weeks) to the study of story information, we were able to expand students' opportunities to explore the film and trace causal actions and events within the major plot and subplots. Multiple episodes from the film and corresponding narratives were examined to provide students with a mental model of various dimensions of stories. The anchor provided many opportunities for reading, writing, and using oral language. For example, students in the experimental groups selected film scenes to dramatize characters' roles and story events. They wrote scripts, writing

like the author of a mystery, and they participated in multiple writing activities that focused on the conditions under which to use story information. Our introduction of a second video anchor, Oliver Twist, was a another way we changed our curriculum during the second year. This film and a book, The Wolves of Willoughby Chase, that were both set in the Victorian Era, provided our students with additional rich examples of causally-oriented story development.

We specifically attempted to make the control group's instruction a very good curriculum, supplementing basal activities with additional reading and writing activities. We believe it does little good to show that an experimental group performs better than a group that doesn't receive instruction on the information that is being assessed or that receives poor instruction. Consistent with our plan for the experimental groups, instruction for the control groups was conducted for seven months. We emphasized all the same concepts and story information that were emphasized in the macrocontext instruction. Students in the experimental and control groups had a comparable amount of opportunities for exploring story characteristics. The major difference between the experimental and control groups involved the presence versus absence of the video-based macrocontext. Story characteristics were taught separately and in discrete contexts (i.e., in unrelated narratives).

Objectives

The goal for our study of reading comprehension and use of

story information was to determine the effects of macrocontexts on (1) students' ability to describe character traits, character feelings, and character motives related to feelings; (2) students' ability to identify story grammar elements; (3) students' comprehension of causal information relevant to plot development; and (4) students' use of story grammar elements in student-generated written stories.

Experimental groups. Similar to the plan of our first year, our unit of lessons was organized around the theme of detectives solving problems. The film, Young Sherlock Holmes, was selected as the macrocontext to illustrate the methods of a detective, which provide a metaphor for reading comprehension, character analysis, plot development (all involving a search for clues). The unit began with a discussion of good detectives to formulate characteristics of main characters in the video and to establish the concepts of "protagonist" and "antagonist". Characteristics of the setting (London, England during Victorian era) were studied. The plot of the video was discussed to identify conflicts resulting in goal setting and subsequent events that led to goal resolution. Sequential events were drawn on a timeline. Students read the Sherlock Holmes mystery to compare this mystery to the movie and to analyze character traits and plot development. Students compared the Sherlock video and text and identified components of subplots within each context.

A second film and text were used to study target concepts. The film, Oliver Twist, was introduced to build comparative and contrasting sets of information related to the setting of Victorian

England, characterization, and plot development. Students read Alexandra the Rock Eater and traced elements of plot development (initiating events, goal-setting behaviors, subsequent events, resolution).

Across the lessons, students participated in writing activities and literature circles to discuss authors' use of story components. Additionally, students' writing was published in a class newsletter.

Control groups. Students were asked to describe and identify story elements with each element introduced in the context of a different and unrelated story. Students read different narratives to identify traits of main characters, setting information, and the sequence of story events. Students analyzed several narratives for plot development and organized events from one story to produce a cartoon. They completed worksheets requiring them to identify elements of stories and skillpak activities accompanying the basal stories and unrelated to story elements. Participatory activities involved students in dramatization of story information, writing and composing stories for the class newsletter, and deciphering coded messages.

## Results

To analyze students' comprehension of characterization, two posttest measures were administered. First, students were asked to read a narrative and then interpret character traits and character feelings, and provide information from the text to explain a reason (motive) for these feelings. Second, students

were asked to view video scenes and explain character feelings and corresponding motives. Mean scores and standard deviations for each groups' performance on the measures of character analysis are reported on Table 3. Data analysis revealed a significant difference between each experimental group and control group on the measure requiring descriptions of character's feelings and motives for these feelings during the story reading task. A significant difference was found between experimental group 2 (average achievers) and its control group on the measure requiring identification of character traits. No other significant differences were found.

On Table 4, we present the mean scores and standard deviations for each groups' performance on the identification of story elements. A comparison of pretest and posttest means on the measure requiring students to identify story elements in a science fiction story revealed significant main effects for trial for all students on several variables, with experimental group 1 (at risk students) achieving significant pretest/posttest gains on seven of the eight variables as compared to its control group achieving significant pretest/posttest gains on two of the eight variables. The analysis of posttest means revealed that the performance of experimental group 1 (at risk students) was significantly different from its control group on identification of characters, initiating events, attempts and outcomes, resolution of goal, and the overall total score.

Mean scores and standard deviations corresponding to students' performance on a set of questions that required comprehension of

causal information are presented on Table 5. For the measure requiring students to read a story and comprehend causally-related ideas that were either explicitly or implicitly stated, or that occurred either within or between episodes, the analysis revealed significant pretest/posttest gains for experimental group 1 (at risk students) on information stated implicitly, information relating different episodes, and the total score. Analysis of posttest means revealed that experimental group 1 was significantly different from its control group on comprehension of causal information occurring within episodes.

For our fourth assessment, we asked the students to write a mystery. The analysis of posttest means (and standard deviations) reported on Table 6 representing inclusion of story elements within student-written stories revealed that both experimental groups were significantly different from their control groups in generation of plot information and on overall (total score) performance. Stories written by students in the experimental groups were causally-coherent stories--stories bound by events that were linked explicitly to goal identification and goal resolution (See Figure 1).

## CONCLUSIONS

During the second year of our project, a major goal for seven months of our experimental curriculum was to enhance students' knowledge about stories. Across the two years of our project, but particularly in year two, our instruction went far beyond the teaching of structural elements of stories. Young Sherlock Holmes,

Oliver Twist, and corresponding narratives provided us with rich contexts for our students to examine how story elements vary as a function of the particular story context. Instructing our students to study the subplots and the major plot for specific conflicts, motives or reasons for the conflicts, corresponding methods of resolving the problem, and specific outcomes associated with the resolution of each conflict provided our students with a broader and more detailed understanding of the properties of a good story. Our findings seem to support Stein's (1986) claim that coherent stories and appropriate content in stories are generated by students who benefit from instruction that enhances students' knowledge of story structure and students' knowledge of central story information (e.g., obstacles that preclude goal attainment). Our experimental instruction provided an indepth study of story elements (Mandler, 1984). More importantly, though, the study of these elements in our macrcontext--with elements tied directly to the anchor--seemed to enhance students' integrated knowledge structures, as evidenced by our students' ability to comprehend and generate causally-coherent structures within stories. In contrast, when students have been instructed in the structural characteristics of stories in a disjointed manner, and if they lack rich examples of how to develop the content of these story elements, stories can be incoherent or lack information needed for connections across story elements (Stein et al., 1986; Stein & Policastro, 1984).

Our analysis of students' performance during our second year on measures of story elements, reading comprehension, and story

composition revealed large differences between the experimental and control groups on several measures. Experimental students, across ability levels, were better able to describe character's feelings and corresponding motives, and they wrote stories that were more causally-cohesive, generating plots that linked character actions and events to goal statements and goal resolution. The measure of character analysis required comprehension of text-implicit information and the identification of text information to support inferences. The findings on the second measure, requiring students to compose their own stories, suggest knowledge of story elements influenced the search and judgment processes necessary to the formation of stories. Students' inclusion of story elements to create coherent stories suggests that the students, across ability levels, were monitoring what they wrote according to their knowledge of a story as a whole.

On several measures, the analysis of data revealed that the macrocontext instruction was especially effective for students who are at risk for academic failure. When asked to identify story structural elements in a story that they read, these students were able to identify correctly all the information related to plot development. When asked to comprehend causally-related ideas in a story, these students made significant gains in the ability to determine text-implicit information and causally-linked ideas that occurred between episodes. This finding seems particularly interesting since many low achievers experience comprehension difficulties when they are required to interpret text-implicit information. Overall, our findings suggest that the experimental

groups are using information learned during video-based instruction to aid their interpretation and composition of narratives.

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Table 1. Mean scores for students' identification of story elements, written retelling, and comprehension of causal relationships

| Group | Story Element[a] | | Written Retellings[b] | | Causal Relationships[c] | |
|---|---|---|---|---|---|---|
| | n | M | n | M | n | M |
| Video, Avg Ach | 13 | 5.6 | 13 | 5.8 | 12 | 8.5 |
| Non-video, Avg Ach | 13 | 4.5 | 13 | 4.8 | 12 | 8.4 |
| Video, At-Risk Students | 11 | 4.5 | 11 | 2.1 | 13 | 6.5 |
| Non-video, At-Risk Students | 12 | 4.8 | 12 | 4.1 | 14 | 7.9 |

[a]Total possible = 14
[b]Total possible = 7
[c]Total possible = 17

Table 2. Mean scores and (standard deviations) of story grammar elements in student-generated stories

| Story Grammar Elements | Experimental | | Control | |
|---|---|---|---|---|
| | Pretest | Posttest | Pretest | Posttest |
| Setting (4) | 3.3 (1.1) | 3.9 (0.3) | 3.0 (0.8) | 3.0 (1.0) |
| Theme (2) | 0.9 (0.9) | 1.5 (0.7) | .9 (0.8) | 1.0 (0.9) |
| Plot (2) | 0.9 (0.7) | 1.5 (0.6) | 1.0 (0.6) | 0.9 (0.6) |
| Resolution (3) | $0.9^{1}$ (0.9) | $2.1^{*1}$ (0.8) | 0.7 (0.8) | $0.9^{*}$ (0.8) |
| Causal/Coherence (4) | $1.3^{1}$ (1.5) | $3.2^{*1}$ (1.0) | 1.2 (1.3) | $1.6^{*}$ (1.3) |
| Total (15) | $7.4^{1}$ (3.8) | $12.1^{*1}$ (2.6) | 6.9 (3.1) | $7.5^{*}$ (3.6) |

*$p < .01$ for pairwise comparisons.
Note: Means within rows that differ significantly ($p < .01$) share superscripted numbers

Table 3. Mean scores and (standard deviations) for character analysis

| Group | Character Trait[a] n | | Character Feelings/ Motive[b] n (Text) | | Character Feelings/ Motive[c] n (Video) | |
|---|---|---|---|---|---|---|
| Experimental1[d] | 20 | 3.1 (2.9) | 21 | 7.61[1] (3.3) | 22 | 4.7 (2.1) |
| Experimental2[e] | 14 | 4.7[1] (2.2) | 14 | 7.8[2] (2.9) | 11 | 5.5 (1.8) |
| Control1[d] | 16 | 1.8 (2.2) | 17 | 3.9[1] (3.3) | 19 | 4.5 (2.0) |
| Control2[e] | 12 | 2.3[1] (2.1) | 11 | 4.3[2] (2.8) | 14 | 4.3 (2.1) |

[a]Maximum score is 8
[b]Maximum score is 12
[c]Maximum score is 8
[d]At-risk students
[e]Average achievers
Note: Means within columns that differ significantly ($p < .05$) share superscripted numbers.

Table 4. Pretest and posttest means and (standard deviations) for identification of story grammar elements

| Story grammar (Maximum score) | Groups | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Experimental1[a#] | | Control1[a#] | | Experimental2[b&] | | Control2[b~] | |
| | Pre | Post | Pre | Post | Pre | Post | Pre | Post |
| Setting (2) | .7 (.4) | 1.0* (.4) | .9 (.4) | 1.0 (.5) | 1.1 (.3) | .9 (.4) | 1.0 (.5) | 1.1 (.5) |
| Characters (2) | 1.4 (.6) | 2.0*[1] (.0) | 1.3 (.7) | 1.5[1] (1.7) | 1.0 (.9) | 1.7* (.5) | 1.4 (.7) | 1.7* (.5) |
| Initiating event (1) | .1 (.3) | .9*[1] (.3) | .3 (.5) | .5[1] (.5) | .2 (.4) | .5 (.5) | .3 (.5) | .7* (.5) |
| Goal (1) | .6 (.3) | .8* (.5) | .3 (.4) | .7* (.5) | .5 (.5) | .8* (.4) | .5 (.4) | .9* (.3) |
| Attempts/ Outcomes (4) | 1.7 (1.5) | 2.6*[1] (1.2) | 1.4 (1.4)a | 1.4[1] (1.5) | 1.5 (1.6) | 3.1* (1.5) | 3.6 (.15) | 2.4 (1.7) |
| Resolution (1) | .4 (.5) | .6*[1] (.5) | .1 (.3) | .4*[1] (.5) | .2 (.4) | .8* (.3) | .3 (.5) | .8* (.4) |
| Reaction (1) | .2 (.4) | .6* (.5) | .2 (.4) | .3 (.4) | .2 (.4) | .3 (.5) | .2 (.4) | .5* (.4) |
| Total (12) | 5.0 (2.3) | 8.7*[1] (1.9) | 4.5 (2.6) | 5.8[1] (2.7) | 4.7 (2.8) | 7.8* (2.3) | 5.2 (2.9) | 8.0* (2.9) |

At risk students &n=12
Average achievers ~n=11
n=19 *p<.05 for pairwise comparisons
Note: Means within rows that differ significantly (p<.05) share superscripted numbers.

Table 5. Pretest and posttest means (and standard deviations) for comprehension of causal information

| Causal Information (Maximum score) | Experimental1[a#] Pre | Experimental1[a#] Post | Control1[a&] Pre | Control1[a&] Post | Experimental 2[b~] Pre | Experimental 2[b~] Post | Control2[b~] Pre | Control2[b~] Post |
|---|---|---|---|---|---|---|---|---|
| Text explicit (6) | 3.9 (.9) | 4.1 (1.1) | 3.2 (1.3) | 3.0 (1.1) | 4.6 (2.9) | 3.8 (1.3) | 3.5 (.8) | 3.3 (1.1) |
| Text implicit (10) | 3.8 (1.7) | 5.2* (1.6) | 3.8 (1.7) | 4.0 (2.1) | 3.9 (2.1) | 4.5 (2.6) | 2.9 (1.3) | 3.6 (1.9) |
| Within episodes(5) | 2.8 (.8) | 3.1[1] (.7) | 3.1 (.7) | 2.4*[1] (.9) | 3.6 (1.5) | 3.3 (.8) | 2.8 (.6) | 3.2 (.9) |
| Between episodes(4) | 1.5 (.4) | 2.1* (1.1) | 1.2 (.8) | 1.5 (.9) | 1.8 (.7) | 1.9 (1.1) | 1.3 (.6) | 1.4 (1.1) |
| Total(16) | 7.7 (2.3) | 9.2* (2.5) | 7.0 (2.6) | 7.1 (2.7) | 6.9 (3.1) | 8.3 (3.3) | 6.5 (1.9) | 6.9 (2.9) |

[a] at risk students
[b] average achievers
[#] n = 16
[&] n = 15
[~] n = 11
*p<.05 for pairwise comparisons.
Note: Means within rows that differ significantly (p<.05) share superscripted numbers.

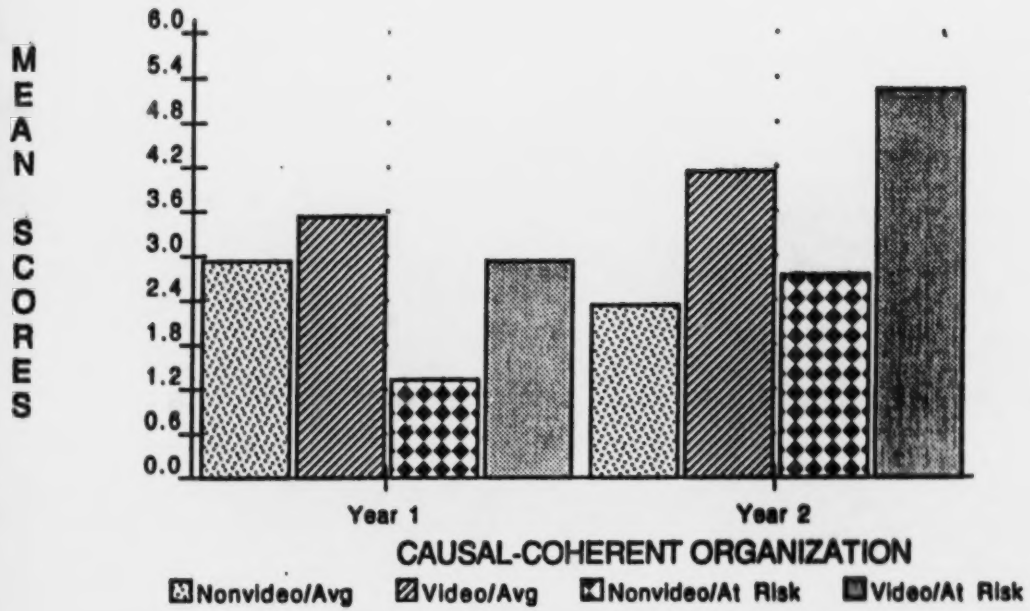


Figure 1. Student composed stories--years 1 and 2.